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HEPATITIS B (J LIM, SECTION EDITOR)

Epidemiology and Treatment of Hepatitis B in Prisoners

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Abstract
Purpose of Review The review details recent literature reports regarding Hepatitis B Virus (HBV) and, in particular, Hepatitis B prevalence/incidence in incarcerated populations around the world. Furthermore, the review will summarize the national/international guidelines regarding HBV and look at diagnosis, vaccination, treatment, and linkage to care after release.
Recent Findings HBV affects prisoners at a much higher rate than the general populations. Many who are at increased risk for HBV infection are also at increased risk for incarceration. Incarcerated settings also have higher rates of HBV transmission.
Summary Incarcerated individuals should be immunized if they are not already immune to HBV. Increased access to safe injecting and tattoo paraphernalia, condoms, and personal hygiene equipment could reduce the spread of HBV and other blood-borne and sexually transmitted infections. Future research should focus on ways to prevent the spread of HBV and similar viruses in incarcerated settings in order to protect incarcerated individuals and the general public. Research on effective linkage to community HBV care following release is needed.

Keywords Hepatitis B · Hepatitis B in prisoners · HBV prevention · Vaccination · Injection drug use · Sexually transmitted infections (STI)

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Introduction

Hepatitis B virus (HBV) is a DNA virus that can lead to chronic viral infection of the liver. Infection can progress to cirrhosis and hepatocellular carcinoma; however, HBV is both preventable with vaccination and treatable with antiviral therapy. Transmission occurs via exposure to infectious blood or body fluids. As of 2015, the World Health Organization estimates that 257 million people are chronically infected with HBV globally [1]. Worldwide, over 686,000 people die each year from complications related to HBV, especially cirrhosis and liver cancer [2, 3•].

Vaccination at birth is highly effective at preventing chronic HBV infection and plays a large role in reducing the expected burden of chronic HBV infection in the decades to come. However, a significant proportion of the at-risk population remains unvaccinated, leading to new HBV infections each year. Therefore, chronic HBV infection remains an ongoing health concern for the present and into the future.

Prisons and jails have populations with higher rates of blood borne infections, including HBV, due to the concentration of impoverished and vulnerable groups of people at increased risk in these settings, such as people who inject drugs and people who exchange sex for drugs or money. Time during incarceration and immediately after release back to the general community has also been implicated in transmission

of HBV infection. Prisons are a potential location for treatment of chronic illness, including chronic HBV infection [4••, 5•]. However, during our review of the literature, we found no descriptions of treatment of active hepatitis B infection in prisoners. While infant vaccination is a key component of reducing the global burden of chronic HBV infection, vaccination of high-risk adults, including those who are incarcerated, is also important [6•].

This review will examine recent reports in the literature to attain a better understanding of current HBV prevalence and incidence rates in incarceration settings around the globe. Current national and international guidelines will be reviewed with a focus on diagnosis, linkage to care after release, and treatment along with vaccination of incarcerated populations. Suggestions for policy reform will be addressed.

Prevalence in the USA

In the USA, where the incarceration rate is the highest in the world, and where there have been the most studies of incarcerated populations, the Centers for Disease Control and Prevention (CDC) estimates that across the entire USA between 850,000 and 2,200,000 people have chronic HBV infection [7••]. Estimates for the seroprevalence of HBV infection in the USA among incarcerated individuals vary and are heterogeneous (Table 1). Point estimates for percentage of incarcerated population with HBV infection range from 0.9 to 11.4% for HBsAg (active, infectious HBV) and from 6.5 to 42.6% for HBcAb (ever infected). The seroprevalences reported in the published literature regarding incarcerated populations in the USA vary more from each other than can be explained by chance or within-study sampling error. Possible sources of the heterogeneity in reported rates in HBV infections among the US incarcerated population include the mean age of the incarcerated individuals (above or below 31 years of age). Additionally, the baseline differences in risk behaviors among the incarcerated populations studied, such as differing rates of injection drug use and sexual practices, may account for some of the heterogeneity in HBV prevalence estimates [8]. Therefore, relying on prevalence studies in specific incarcerated populations may not provide prevalence rates that are generalizable to other incarcerated populations within the same country.

Prevalence in the Rest of the World

There are several studies on HBV prevalence in incarcerated populations in the rest of the world (Table 1). In a Hungarian prevalence study that targeted a population of incarcerated individuals, it was found that the individuals had HBsAg detected in their blood at a rate of 1.5% (72 of the 4894). However, it should be noted that the study was a voluntary opt-in screening sample rather than a random sample (4894 of the 14,331 total incarcerated people volunteered to participate) so, rates may not accurately reflect the true prevalence rate [9].

A prevalence study from Razavi Khorasan province in northeast Iran reported a sero-prevalence of HBsAg of 4.2% (3.5% for females and 4.3% for males) and a prevalence of HBV DNA by PCR of 2.1% among incarcerated individuals. This was a random sample of individuals incarcerated in the province who then voluntarily consented to blood testing [10].

Table 1 Global prevalence of HBV in incarcerated populations

Reference No.	Year/country	Prevalence: HBsAg (%)	Seroprevalence: HBcAb (%) (HBsAb was noted)	Prevalence: HBV DNA* (%)	Representative Sample? (Y/N)	Other Info:
8	2009/USA	0.9–11.4%	6.5–42.6%	N/A	Yes	Both men and women sampled
9	2011/Hungary	1.5%	N/A	N/A	No. Voluntary opt-in screening	9.2% of participants were female
10	2008/Iran	4.2% (Females: 3.5%) (Males: 4.3%)	N/A	2.1%	Yes	No significant differences between seroprevalence of HBV among females and males
11	2013/Indonesia	3.2%	N/A	2.4%	No	Subjects are suspected drug users by prison officers
12	2016/Turkey	2.6%	35% (HBsAb)	N/A	No	Only inmates that committed robbery, sexual assault, assaults, substance abuse, or selling of substances were allowed to participate.
13	2015/Mexico	0.15% (Females: 0.3%) (Males: 0.1%)	2.8% (Females: 3.0%) (Males: 2.8%)	N/A	Yes	

The prevalence of HBV surface antigen and also DNA by PCR in four prisons in Central Java has been studied among incarcerated individuals who reported using drugs. Individuals were identified as being someone who used drugs by the staff of the correctional facilities. Of the 375 individuals identified and approached, all 375 volunteered to participate. The prevalence of HBsAg was 3.2% (12 of the 375 tested) and nine of these 12 had circulating HBV DNA by PCR. Of the 12 individuals with HBV surface antigen positive, one reported injection drug use. Other risk factors seen in this group included oral surgical operations and sex with an individual who was not Indonesian. This study included all incarcerated individuals in the study area who were identified as drug users by correctional facility staff; however, the authors note that the rate of drug use in this area of Indonesia is lower than the rates in other areas of the country, e.g., in Jakarta. In particular, the rate of injection drug use is also lower. They do not discuss whether practices around oral surgery differ by geographic location within Indonesia. Due to the difference in risk factors such as injection drug use from other incarcerated populations in Indonesia, this prevalence rate may not reflect that of the entire country [11•].

A HBsAg prevalence of 2.6% and a positive Anti-HBs prevalence of 35% was reported among a prison in Turkey. However from the article, it is unclear whether the sample was selected from all incarcerated individuals or those presumed to be at higher risk a priori based on nature of the crime leading to incarceration [12••].

In Mexico City, over 15,500 incarcerated men and nearly 1800 incarcerated women consented to participate in a study on the prevalence of HBsAg and HBcAb. The rate of HBcAb among men was 2.8% and among women the rate was 3.0%. The rate of HBsAg among men was 0.1% and among women was 0.3%. The study also included a representative sample of the participants who reported on risk factors through a survey. While 5.4% of men and 3.7% of women reported injecting drugs at least once, 48.4% of men and 55.1% of women reported injecting non-prescribed vitamins at least once. Among those who reported injecting drugs, the percentage who reported sharing needles or syringes decreased during incarceration from 26.3% of men and 30.8% of women ever sharing to 8.3 and 2.5%, respectively, who shared at least once while incarcerated. However, among those who injected non-prescribed vitamins, the percentage reporting sharing needles or syringes increased during incarceration. While just 2.3% of men and 0% of women shared needles or syringes outside prison, this increased to 3.3% of men and 5.3%, of women, who shared needles or syringes during the previous month while incarcerated. Approximately half the men and women had at least one tattoo, and of those with any tattoos nearly half had received at least one tattoo while in prison. With respect to tattoos received outside of prison, nearly half the men and a third of the women with tattoos reported knowingly using unsterile equipment for at least one tattoo. About 20% of the men and women reported condom use during their most recent sexual encounter either inside of or outside of prison [13].

Incidence

In the USA, the CDC reported 2791 acute cases of HBV infection nationally in 2014 with a rate of 0.9 per 100,000 and 12,400 newly confirmed chronic infections [14•]. Between 1999 and 2002, the CDC reported the overall prevalence of current or previous HBV infections among adult prisoner was between 13 and 47% [15]. In a study conducted between 1998 and 2000 that looked at males in Rhode Island prisons, the HBV prevalence was 20.2%, and the incidence per 100 person-years was 2.7 [16].

It is difficult to find studies published within the last 5 years reporting incidence of HBV infection or transmission occurring during incarceration. However, a study published in 2013 looked at risk factors for chronic HBV infection among prisoners, who were also injection drug users, in Isfahan, Iran. Nine hundred seventy prisoners participated in the study, and 264 (27.2%) tested positive for any HBV serological markers. Furthermore, the study came to the conclusion that individuals with higher frequency of incarceration and also those with longer total duration of incarceration are more likely to have been exposed to either hepatitis B virus or hepatitis B immunization. However, it is difficult to determine if this exposure occurred during incarceration or following release back to the community. Secondly, with over 70% of the incarcerated population who report ever injecting drugs having no positive HBV serological markers, there is a large opportunity for vaccination in this setting [17].

Risk Factors for Infection

During active infection, HBV viral DNA is present and infectious in blood, semen, and saliva. Routes of transmission include sharing needles and other drug injection paraphernalia, sexual activity, sharing tattoo paraphernalia, sharing razors or toothbrushes, and fights involving breaks in skin and bleeding [4••, 18]. Thus, risk factors for HBV transmission include sharing personal items such as toothbrushes, razors and injecting equipment, use of contaminated drug injecting equipment, sex, tattooing or piercing, needle or sharps injuries, and failure to adhere to standard precautions in medical environment [19]. The criminalization of injection drug use and commercial sex work leads to the concentration of individuals engaging in these activities in incarcerated settings [15, 16]. Furthermore, poor access to sterile injecting paraphernalia, condoms, and personal hygiene equipment, such as toothbrushes and razors, increase the rate of shared equipment, which increases the likelihood of contracting HBV when incarcerated [14•, 15, 19, 20].

Diagnosis, Linkage to Care, and Retention in Treatment

Approaches for the diagnosis of blood borne viral infections, specifically HIV, HBV, and HCV, among incarcerated populations, have been described in a literature review, which supports routine opt-out, and to a lesser extent, opt-in testing regimens upon incarceration over testing regimens based on risk stratification or testing "on request" only. Under opt-out regimens, rates of 22 to 98% of incarcerated individuals opting for testing are seen [21•]. These reports were mainly studies regarding HIV testing; however, similar rates can likely be obtained when testing for HBV due to the similarities regarding concerns around confidentiality and stigma, along with logistics regarding timing of testing and case notification if the individual is quickly released to the community, for these two viral infections. The optimal timing to conduct testing is unclear as immediately upon incarceration a significant percentage of individuals are intoxicated or otherwise deemed unable to consent [22]. Delaying testing for 7 days, however, can result in missing the diagnosis for individuals who decline testing or are released to the community in the interim [23]. Screening programs involve more than just administrative requirements; they must also be implemented in actuality per policy in order to be effective. For example, a survey at a female prison in Greece showed only 42.6% reported being tested for HBV infection despite a legal requirement of compulsory diagnostic testing for prisoners by the Greek Penal Code [24]. This suggests significant opportunity for increased screening of incarcerated individuals even in settings where universal screening is already required by policy.

Physicians with expertise in the treatment of HBV should be involved in determining the timing of treatment initiation and the medications selected for treatment. There are seven approved medications for treatment of chronic HBV infection. Of the seven medications, two are commonly used as first line due to their effectiveness and low side effect profile: entecavir and tenofovir disoproxil (TDF). Guidelines do not specifically address when to start treatment**.** Due to concerns regarding acute liver injury when stopping effective medications, caution and very close monitoring is advised if there is a decision to discontinue the antiviral medication. This is important during transitions of care, including both upon incarceration and upon release to the community [25].

The WHO's guideline regarding chronic HBV infection aims to be relevant to all clinical settings, in particular to those in low and middle income countries. The document recommends starting treatment for individuals who also have cirrhosis (based on blood test for ALT and platelets) or who have HIV co-infection. If neither cirrhosis nor HIV are present, then the WHO guideline stratifies their recommendation on whether to initiate treatment by age above or below 30, elevation of ALT, and a circulating HBV DNA virus level above 20,000 (if such testing is available). The first line agents recommended for treatment are Tenofovir disoproxil and entecavir. Treatment for individuals with cirrhosis should not be interrupted. Individuals who do not have cirrhosis can consider discontinuation of treatment in exceptional circumstances if close follow-up can be ensured. Screening for hepatocellular carcinoma every 6 months with abdominal ultrasound and alpha-fetoprotein is recommended for all individuals with cirrhosis, individuals with a family history of hepatocellular carcinoma, and those over age 40 if their HBV DNA level is over 2000 IU/ml [26••].

This guideline does not specifically address treatment considerations of incarcerated individuals. However, the recommendation to involve a clinician with expertise in HBV infection in the care of patients, including the decision on timing of treatment initiation, along with the recommendation to continue treatment without interruption except in specific circumstances with a careful plan for close follow up, emphasizes the importance of continuous medical care for individuals with chronic HBV infection throughout incarceration and through release back into the community. Recent studies describing successful programs linking HBV care during incarceration through release to the community are lacking in the literature.

Prevention

HBV vaccination recommendations and rationales for incarcerated individuals have been described and detailed. Vaccinations have been successful among incarcerated individuals on shorter schedules than those for routine childhood vaccination schedules. These regimens include a three-dose schedule with doses at months 0, 1, and 2 along with an even more rapid three-dose schedule with doses at days 0, 7, and 21 [27••].

The 2015 WHO guidelines for HBV recommend several programs for individuals who inject drugs related to prevention of infection with HBV. These include needle and syringe programs, opioid substitution therapy, and rapid hepatitis B vaccination programs along with incentives to increase uptake and completion of the vaccination schedule [24]. These recommendations can be implemented among incarcerated populations.

The United Kingdom recommends that all adults in prisons (from the age of 15 and up) who are not immune to HBV to receive the vaccine at zero, seven, and 21 days and also a booster 1 year later if still incarcerated at that time. For children up to age 14, they recommend a four-dose schedule at zero, one, two, and 12 months [17]. The CDC recommends vaccination for HBV among all unvaccinated adults in high-risk settings, including correctional facilities [28]. Algorithms for post exposure prophylaxis with vaccination and also hepatitis B immunoglobulins are available. No mention is made

regarding opioid substitution therapy in these particular documents.

Access to Vaccination

Literature regarding access to medication or treatment for incarcerated individuals already infected with hepatitis B simply does not exist at this time and is an area ripe for future research. There is, though, literature that delves into the topic of vaccination programs for incarcerated individuals. In 2001, 36 state juvenile correctional systems had HBV prevention programs. Furthermore, 65% of states had established policies regarding the prevention of the spread of HBV in juvenile correctional facilities [29]. In a 2001 survey regarding adult correctional systems, 35 states responded and of those states, 26 states and the Federal Bureau of Prisons offered some sort of HBV vaccination program. Only two states, however, routinely offered HBV vaccination to incarcerated individuals, and nine states did not have any form of HBV vaccination programs for those who are incarcerated [30]. In 1999, the state of Texas, which had 105 adult facilities, appropriated funds to offer HBV vaccination to all inmates [29, 31].

Scotland, England, and Wales have successfully established routine HBV vaccination programs in their correctional systems [32, 33]. Besides these studies, there is scant literature regarding the establishment of HBV vaccination programs for incarcerated individuals outside the United States. Studies conducted in Iran, Hungary, Nigeria, New South Wales, and Marseille; however, all concluded that the implementation of HBV vaccination programs in correctional systems is paramount in the on-going public health initiative to eradicate the spread of HBV [9, 17, 34, 35, 36]. Although the CDC recommends that all at-risk incarcerated individuals receive the HBV vaccination, the large number of correctional systems that do not have HBV vaccination programs or that have limited programs, in both the USA and abroad, represents a critical barrier to care for incarcerated individuals—especially the large number of individuals who engage in activities that are deemed high-risk for acquiring and/or spreading HBV.

Conclusions

HBV affects incarcerated individuals at a higher rate than in their surrounding populations. This risk varies by geographic location and is predominantly a reflection of varying rates of HBV infection in the general population. Incarcerated individuals who are not already infected with HBV are at increased risk of acquiring infection during incarceration and also upon release back into the general population. Incarcerated individuals who are not already immune to HBV should be immunized. Those who are infected should be evaluated by a medical provider specializing in chronic viral liver infections, and careful consideration should be given to initiating antiviral medications. Continuation of medication upon release to the community is important; descriptions of successful linkage programs are lacking in the literature. In addition, jails and prisons should consider providing access to medications for addiction treatment (MAT) [37], safe injecting paraphernalia, tattoo paraphernalia, condoms, and personal hygiene equipment in an effort to reduce the spread of chronic blood-borne and sexually transmitted infections, such as HBV, among incarcerated individuals.

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Compliance with Ethical Standards

Conflict of Interest Jacob M. Smith, A. Ziggy Uvin, Alexandria Macmadu, and Josiah D. Rich declare that they have no conflict of interest.

Human and Animal Rights All reported studies/experiments with human or animal subjects performed by the authors have been previously published and complied with all applicable ethical standards (including the Helsinki declaration and its amendments, institutional/national research committee standards, and international/national/institutional guidelines).

References

Papers of particular interest, published recently, have been highlighted as:
- • Of importance
- •• Of major importance

1. Hepatitis B. In: World Health Organization. http://www.who.int/mediacentre/factsheets/fs204/en/. Accessed 30 May 2017.
2. GBD 2013 Mortality and Causes of Death Collaborators. "Global, Regional, and National Age-Sex Specific All-Cause and Cause-Specific Mortality for 240 Causes of Death, 1990–2013: A Systematic Analysis for the Global Burden of Disease Study 2013." *Lancet (London, England)* 385, no. 9963 (January 10, 2015): 117–71. doi:10.1016/S0140-6736(14)61682-2.
3.• Dolan K, Wirtz A, Moazen B, et al. Global burden of HIV, viral hepatitis, and tuberculosis in prisoners and detainees. Lancet. 2016;388:1089–102. **The report focuses on the challenges and opportunities that prison settings create for the prevention and treatment of HIV, viral hepatitis, and/or tuberculosis.**
4.•• Kamarulzaman A, Reid S, Schwitters A, Wiessing L, El-Bassel N, Dolan K, et al. Prevention of transmission of HIV, hepatitis B virus, hepatitis C virus, and tuberculosis in prisoners. Lancet. 2016;388:1115–26. **One of the several important reports that details the risk/prevalence of HIV, HBV, HCV, and Tuberculosis in prisons and comments on prevention strategies.**
5.• Rich J, Beckwith C, Macmadu A, et al. Clinical care of incarcerated people with HIV, viral hepatitis, or tuberculosis. Lancet. 2016;388:1103–14. **The review focuses on the clinical management of those with HIV, viral hepatitis, and/or tuberculosis in an incarcerated setting.**

6.• Nelson N, Easterbrook P, McMahon B. Epidemiology of hepatitis B virus infection and impact of vaccination on disease. Clinics in Liver Disease. 2016;20:607–28. **The report details the success of preventing the spread of HBV by vaccinating high-risk adults and the difficulties associated with accessing and vaccinating this high-risk population.**

7.•• HBV FAQs for Health Professionals | Division of Viral Hepatitis | CDC. In: Cdc.gov. https://www.cdc.gov/hepatitis/hbv/hbvfaq.htm. Accessed 30 May 2017. **The page provides a brief overview and gives statistics about acute and chronic HBV in the United States.**

8. Harzke A, Goodman K, Mullen P, Baillargeon J. Heterogeneity in hepatitis B virus (HBV) seroprevalence estimates from US adult incarcerated populations. Ann Epidemiol. 2009;19:647–50.

9. Tresó B, Barcsay E, Tarján A, Horváth G, Dencs Á, Hettmann A, et al. Prevalence and correlates of HCV, HVB, and HIV infection among prison inmates and staff, Hungary. Journal of Urban Health. 2011;89:108–16.

10. Khajedaluee M, Babaei A, Vakili R, Valizade N, Homaei Shandiz F, Alavian S, et al. Sero-prevalence of blood-borne tumor viruses (HCV, HBV, HTLV-I and KSHV infections) and related risk factors among prisoners in Razavi Khorasan Province, Iran, in 2008. Hepat Mon. 2016; doi:10.5812/hepatmon.31541.

11.• Prasetyo A, Dirgahayu P, Sari Y, Hudiyono H, Kageyama S. Molecular epidemiology of HIV, HBV, HCV, and HTLV-1/2 in drug abuser inmates in central Javan prisons, Indonesia. The Journal of Infection in Developing Countries. 2013; doi:10.3855/jidc.2965. **The report details the prevalence of HBV along with HIV, HCV, and HTLV-1/2 in inmates from central Javan prisons. The inmates were all known drug abusers.**

12.•• Keten D, Emin Ova M, Sirri Keten H, Keten A, Gulderen E, Tumer S, et al. The prevalence of hepatitis B and C among prisoners in Kahramanmaras, Turkey. Jundishapur Journal of Microbiology. 2016; doi:10.5812/jjm.31598. **The report details the prevalence of HBV, HCV, and HIV in a prison population in Turkey and compares prevalence data to the demographics of the subjects.**

13. Bautista-Arredondo S, González A, Servan-Mori E, et al. A cross-sectional study of prisoners in Mexico City comparing prevalence of transmissible infections and chronic diseases with that in the general population. PLoS One. 2015;10:e0131718.

14.• U.S. 2014 Surveillance Data for Viral Hepatitis | Statistics & Surveillance | Division of Viral Hepatitis | CDC. In: Cdc.gov. https://www.cdc.gov/hepatitis/statistics/2014surveillance/. Accessed 30 May 2017. **The CDC page contains data regarding reported cases of HBV from 48 states and estimates the total number of acute cases of HBV infection in the United States.**

15. Transmission of Hepatitis B Virus in Correctional Facilities—Georgia, January 1999–June 2002. In: Cdc.gov. https://www.cdc.gov/mmwr/preview/mmwrhtml/mm5330a2.htm. Accessed 30 May 2017.

16. Macalino G, Vlahov D, Sanford-Colby S, Patel S, Sabin K, Salas C, et al. Prevalence and incidence of HIV, hepatitis B virus, and hepatitis C virus infections among males in Rhode Island prisons. Am J Public Health. 2004;94:1218–23.

17. Dana D, Zary N, Peyman A, Behrooz A. Risk prison and hepatitis B virus infection among inmates with history of drug injection in Isfahan, Iran. Sci World J. 2013;2013:1–4.

18. Gupta S, Altice F. Hepatitis B virus infection in US correctional facilities: a review of diagnosis, management, and public health implications. Journal of Urban Health. 2009;86:263–79.

19. Infection control in prisons and places of detention - GOV.UK. In: Gov.uk. https://www.gov.uk/government/publications/infection-control-in-prisons-and-places-of-detention. Accessed 30 May 2017.

20. Hepatitis B FAQs for the Public | Division of Viral Hepatitis | CDC. In: Cdc.gov. https://www.cdc.gov/hepatitis/hbv/bfaq.htm. Accessed 30 May 2017.

21.• Rumble C, Pevalin D, O'Moore E. The wider impact of routine testing for blood borne viruses in prisons. Eur J Pub Health. 2015; doi:10.1093/eurpub/ckv175.236. **The paper is a systematic review of blood-borne viruses in English prison populations. It reviews current testing policies for at-risk inmates and suggests areas of revision in regards to testing policies.**

22. Kavasery R, Maru D, Sylla L, Smith D, Altice F. A prospective controlled trial of routine opt-out HIV testing in a Men's jail. PLoS One. 2009;4:e8056.

23. Routine Jail-Based HIV Testing—Rhode Island, 2000–2007. In: Cdc.gov. https://www.cdc.gov/mmwr/preview/mmwrhtml/mm5924a3.htm. Accessed 30 May 2017.

24. Geitona M, Milioni S. Health status and access to health services of female prisoners in Greece: a cross-sectional survey. BMC Health Serv Res. 2016; doi:10.1186/s12913-016-1506-3.

25. Brown R, McMahon B, Lok A, Wong J, Ahmed A, Mouchli M, et al. Antiviral therapy in chronic hepatitis B viral infection during pregnancy: a systematic review and meta-analysis. Hepatology. 2015;63:319–33.

26.•• Guidelines for the prevention, care and treatment of persons with chronic hepatitis B infection. In: World Health Organization. http://www.who.int/hiv/pub/hepatitis/hepatitis-b-guidelines/en/. Accessed 30 May 2017. **The World Health Organization's detailed report on how to prevent, care, and treat those with Chronic Hepatitis B infection.**

27.•• Sequera VCAD-G, Valencia S, García-Basteiro AL, Marco A, Bayas JM. Vaccinations in prisons: a shot in the arm for community health. Human Vaccines & Immunotherapeutics. 2015;11:2615–26. **The report details the increased risk prisoners have for acquiring communicable diseases and how vaccination of prisoners can not only protect inmates but also benefit the general population.**

28. A Comprehensive Immunization Strategy to Eliminate Transmission of Hepatitis B Virus Infection in the United States: Recommendations of the Advisory Committee on Immunization Practices (ACIP) Part II: Immunization of Adults. In: Centers for Disease Control and Prevention. https://www.cdc.gov/mmwr/preview/mmwrhtml/rr5516a1.htm. Accessed 30 May 2017.

29. Prevention and Control of Infections with Hepatitis Viruses in Correctional Settings. In: Cdc.gov.

30. Charuvastra A, Stein J, Schwartzapfel B, Spaulding A, Horowitz E, Macalino G, et al. Hepatitis B vaccination practices in state and federal prisons. Public Health Rep. 2001;116:203–9.

31. Hepatitis B Vaccination of Inmates in Correctional Facilities—Texas, 2000–2002. In: Cdc.gov.

32. HUTCHINSON S, WADD S, TAYLOR A, BIRD S, MITCHELL A, MORRISON D, et al. Sudden rise in uptake of hepatitis B vaccination among injecting drug users associated with a universal vaccine programme in prisons. Vaccine. 2004;23:210–4.

33. Beck C, Cloke R, O'Moore É, Puleston R. Hepatitis B vaccination coverage and uptake in prisons across England and Wales 2003–2010: a retrospective ecological study. Vaccine. 2012;30:1965–71.

34. Ewaoche I, Otu-Bassey I, Nabagenyi M, Utsalo S. Prevalence and eligibility for treatment of chronic hepatitis B infection among prison inmates and female sex workers in Calabar, Cross River state, Nigeria. British Microbiology Research Journal. 2016;17:1–10.

35. Larney S, Monkley D, Indig D, Hampton S. A cross-sectional study of susceptibility to vaccine-preventable diseases among prison entrants in New South Wales. Med J Aust. 2013;198:376–9.

36. Rotily M, Vernay-Vaisse C, Bourliere M, Galinier-Pujol A, Rousseau S, Obadia Y. HBV and HIV screening, and hepatitis B immunization programme in the prison of Marseille, France. Int J STD AIDS. 1997;8:753–9.

37. Wakeman S. Medications for addiction treatment. J Addict Med. 2017;11:1–2.